

X-15 Engine Test Complex
Edwards Air Force Base
Rogers Dry Lake, East of Runway
between North Base and South Base
Boron Vicinity
Kern County
California

HAER No. CA-235

HAER
CAL
15-BORON.V,
3-

PHOTOGRAPHS

WRITTEN HISTORICAL AND DESCRIPTIVE DATA

Historic American Engineering Record
National Park Service
Department of the Interior
San Francisco, California

HISTORIC AMERICAN BUILDING SURVEY
EDWARDS AFB,
X-15 ENGINE TEST COMPLEX

HAER
CAL
15-BROWN,
3-

HABS No. CA-235

Location: Approximately 0.3 miles east of the Flight line at Edwards Air Force Base, California.

USGS Edwards (7.5 minute quadrangle, 1992). Township 10 North, Range 9 West, Section 30. Universal Transverse Mercator Coordinates:

Zone 11, 419770 mE, 3865760 mN; 419780 mE, 3865710 mN; 419765 mE, 3866705 mN

Present

Owner: U.S. Air Force, AFFTC, Edwards AFB, California 93523

Present

Occupants: U.S. Air Force, AFFTC, Edwards Air Force Base

Present Use: Storage, Maintenance Shop

Significance: As the only facility for testing X-15 engines, individually and with the aircraft, the X-15 facility is strongly associated with the United States Man-in-Space program, and particularly with the development of North American Aviation's X-15 rocket aircraft. In 1962, the X-15 became the first aircraft to fly beyond the earth's atmosphere, creating the link between atmospheric flight and space flight. Beginning in 1958, tests performed at the X-15 engine test complex resulted in the data needed to modify and refine the X-15's powerful rocket engine. The X-15 complex has been recommended eligible for listing in the National Register of Historic Places under Criterion A.

PART 1. PHYSICAL CONTEXT OF THE SITE

The X-15 engine test complex is located just east of the flight line at Edwards Air Force Base (AFB), south of Taxiway D. It is surrounded by unimproved desert terrain and is accessible via two roads from Taxiway D. The complex consists of 10 buildings and structures within an approximately 2-acre compound surrounded by chain-link fence. Facilities within the complex include two static test stands (one that accommodated the engine, and one that accommodated the entire aircraft, a control bunker, a large maintenance shop, a supply and issue shop, a water storage tank and pump building, and three observation bunkers. The test stands and associated blast deflectors and observation bunkers are located in the northeast portion of the compound.

PART 2. HISTORICAL CONTEXT

Beginnings of Edwards AFB

The need to expand and improve U.S. Army Air Corps (USAAC) airfields and equipment was recognized a decade before the beginning of World War II. Consequently, a bombing and gunnery range associated with March Field was laid out in the Muroc area, which was considered particularly well suited for these purposes. The remote area was mostly unsettled and afforded excellent year-round flying weather and a natural emergency landing field (the hard claypan of Muroc [Rogers] Dry Lake). Additionally, 29,000 acres east of the lake bed were already federally owned. In September 1933, a detachment of 20 men was sent from March Field, Riverside, California, to establish a tent camp in support of the new facility.

In 1940, private land, as well as 127,500 acres of federal lands in and around the lake bed, were acquired to enlarge the bombing and gunnery range, and Muroc Lake Bombing and Gunnery Range was designated a permanent facility of March Field. The following year, a runway and water and sewage systems were constructed, and numerous buildings made up what became known as South Base.

In 1942, the facility was designated a post separate from March Field with the primary mission of training fighter and bomber personnel, and it was renamed Army Air Base, Muroc Lake. The creation of facilities at North Base was boosted by research projects. The Bell XP-59A program to develop the United States' first jet-propelled aircraft resulted in the creation of the Muroc Flight Test Base, and rocket experiments associated with JATO (jet-assisted take off) aircraft development were conducted at the Materiel Center Flight Test Base.

After World War II, the facility was redesignated Muroc AFB in 1948 and rededicated Edwards AFB in 1949. North and South Base facilities were combined, and the base was assigned the mission of providing flight testing for new and experimental aircraft. In 1952, base activities

shifted to the new main base, and most of the facilities at South Base were abandoned and eventually demolished or relocated. At this time, a new runway was built leading into Rogers Dry Lake.

The Beginnings of Experimental Aircraft Research

X-planes are experimental rocket- or jet-powered aircraft designed to address research questions about high-speed, high-altitude flight. The X-planes have their roots in a series of conferences held in March and May 1944. At these conferences, the National Advisory Committee for Aeronautics (NACA) (later known as the National Aeronautics and Space Administration [NASA]), the Army Air Force, the U.S. Navy, and industry representatives agreed to sponsor the development of transonic and supersonic aircraft. This decision was prompted by problems some propeller-driven aircraft encountered at high dive speeds. Some engineers and aerodynamicists had dubbed the speed of sound "the 'sound barrier' beyond which no aircraft could safely pass" (Hallion 1989:284). However, to some the sound barrier presented a challenging design problem.

Design and development of these experimental high-speed aircraft began in 1945. The Navy and NACA preferred a conservative approach concentrating on turbojet-propelled aircraft, but the Army Air Force preferred a more radical design concentrating on rocket propulsion (Hallion 1989). Both categories of aircraft were tested simultaneously at Muroc Army Air Field (later known as Edwards AFB). Periods of testing overlapped and the aircraft were not tested in numerical order.

X-1. The first X-plane to be tested at the Muroc facility was the XS-1 (later referred to as the X-1). The two original XS-1 aircraft were completed in 1945 and 1946 by Bell Aircraft. Powered by the XLR-11-RM-3 engine, the XS-1 was supplied with a total of 6,000 pounds of thrust in four chambers. Though the engine was not throttleable, the chambers could be fired separately or in combination. Completion of the third XS-1 that had been commissioned was held off for the development of a turbopump fuel system (Hallion 1989). On October 14, 1947, Captain Charles E. Yeager of the U.S. Air Force reached a speed of Mach 1.06 and broke the sound barrier in the Bell XS-1 rocket research aircraft.

Yeager's success spurred the design and construction of other experimental aircraft. Another four aircraft (X-1A, X-1B, X-1C, and X-1D) were ordered in April 1948. These were longer than the original X-1s and had a revised cockpit and fuel system. Because they could carry more fuel than their predecessors, these aircraft had higher potentials for speed and altitude. The third X-1 and the X-1D exploded in 1951, and the X-1A exploded in 1955. The X-1C was canceled before completion. The second X-1 was remodeled into the X-1E, with a new turbopump system; revised cockpit; and thin, low-aspect ratio wing. (Hallion 1989.)

The X-1 aircraft ultimately reached Mach 1.45 (957 miles per hour) in March 1948 and in 1954 set an unofficial record altitude for manned flight (90,440 feet), breaking the one held by the balloon Explorer II (72,395 feet) set in 1935. X-1 flights provided testing grounds for several pilot

safety devices, including the T-1 partial pressure suit, and revealed a need for reaction controls to maintain aircraft attitude at high altitudes. The last X-1 flight occurred in 1959. (Hallion 1989.)

While the Air Force was testing the X-1 series of aircraft, the Navy was testing the Douglas D-558-1 Skystreak. The D-558-1 was incapable of supersonic flight. The Navy concentrated on transonic flight (Mach 0.85 to 0.99), which freed the X-1 to explore the supersonic region (Hallion 1989).

X-2. The X-2 aircraft was commissioned in July 1947, and the first X-2 flight was completed on November 18, 1955. The X-2 was designed to achieve speeds of up to Mach 3 and altitudes of 206,000 feet, both representing a 300% increase over existing aircraft performance. The X-2 was powered by the XLR-25-CW-1, the first throttleable rocket engine on an American research airplane. Because it was designed to reach high speeds, it was designed to tolerate very high temperatures. The copper-nickel alloy and stainless steel used in the construction of the aircraft could withstand temperatures of up to 750 degrees Fahrenheit. Because the aircraft was designed for high altitudes, a pressurized cabin with an air atmosphere was included in the design. Issues of pilot safety were addressed by the creation of a jettisonable nose capsule with a drogue parachute, which would slow the capsule down so the pilot could continue with normal bailout procedures. The designers did not foresee, however, the need to incorporate a reaction control system to maintain aircraft attitude.

The X-2 failed to supply very much information about aerodynamic heating and aircraft stability and control characteristics. But the aircraft set an unofficial speed record of Mach 2.87 (1,900 miles per hour) in July 1956, and the first manned flight above 100,000 feet (126,200 feet) occurred in the X-2 on September 7, 1956. At such high altitudes, the X-2 pilot was completely dependent on his flight suit and the pressurized cabin. Flights of the X-2 revealed the necessity for reliable instrumentation for high-speed, exo-atmospheric flight research. A discrepancy was noted between the actual speed and altitude and the speed and altitude reported on the instrumentation in the cockpit. This lag was likely the reason behind an unsuccessful pilot bailout in September 1956. (Hallion 1989.)

During the mid to late 1950s, the Navy was testing the D-558-2. This aircraft had a 35-degree sweptwing design and was designed for ground takeoff and landing. Powered by the Navy equivalent of the XLR-11, it was modified to an air launch vehicle after the D-558-2 exhibited some dangerous low-speed characteristics.

Other X-Series Aircraft. Other experimental aircraft leading up to the X-15 include the X-3, X-4, X-5, and XF-92A, all jet aircraft. The XF-92A was manufactured by Convair and was first flown in September 1948. It was designed to conduct research on delta wing aircraft. The X-4 was manufactured by Northrop Aircraft Company and was first flown in December 1948. The X-4 was designed to research problems of tail-less aircraft. The X-5 was manufactured by Bell Aircraft and first flown in June 1951. It was the first high-performance aircraft to feature variable, in-flight

wingsweep capability, a concept that would later be incorporated into fighter planes. The X-3 was manufactured by Douglas Aircraft and was first flown in October 1952. It never achieved useful speeds or altitudes, but its failures aided in future designs.

The X-15

The X-15 program was initiated in 1952, when NACA directed its laboratories to study problems that were likely to be encountered in flight beyond the atmosphere. It was determined that a manned research vehicle would offer the best possibilities for exploring these problems. Early in 1954, NACA appointed a committee to determine the characteristics of a research aircraft capable of attaining extremely high speeds and altitudes. Later that same year, NACA presented the X-15 project to the research and development branches of the Air Force and Navy, as an extension of the already existing cooperative research airplane program (North American Aviation ca. 1961). In December 1954, bidding was opened to contractors for the design of a high-speed, high-altitude research plane. Four companies entered the competition to design the X-15: Douglas, North American, Bell, and Republic. A year later, the contract to build three planes was awarded to North American Aviation (now known as Rockwell International Corporation) (Hallion 1989).

The design and development of the X-15 advanced the state of the art in several areas, including pilot protection and computer simulation. A completely new full-pressure suit was required. The suit that was designed contained pick-up points and monitored the physiological condition of the pilot. The aircraft also needed environmental controls and life support systems to sustain life in near-space conditions. A computer simulation consisting of a full-scale X-15 cockpit with complete pilot display and instrumentation was used for pilot training, to study pilot reaction to various control system changes, and as a planning tool.

The computer simulation proved invaluable for honing pilot skill. Pilot training was very important because the first 85 seconds of the flight determined if an X-15 mission would be successful. Additionally, pilot skill was important to the success of the mission in case of equipment failure or malfunction. "Without the pilot and system redundancy, the X-15 would have crashed on 13 of its first 44 flights" (Hallion 1989:308). In all, the X-15 attained its research goals on 92% of its flights.

The contract to design and build the XLR-99 engine to power the X-15 was awarded to Reaction Motors Division of Thiokol Chemical Corporation. The same company had produced the XLR-11 engine that powered the X-1. The contract was awarded in February 1956, but the engine was months late in development (Hallion 1989). The design requirements for the XLR-99 called for it to be safe, capable of repeated use, and throttleable. When completed, the engine was fueled by liquid oxygen and liquid ammonia and produced 57,000 pounds of thrust (North American Aviation ca. 1961). It also automatically cut off in case of a malfunction, had idling capabilities, and could be restarted in flight.

Because of the late arrival of the XLR-99 engine, the first X-15 flights were conducted with an interim propulsion system. A pair of XLR-11 engines with a combined thrust of 16,000 pounds powered X-15 flights until November 1960.

Operations and Accomplishments of the X-15 Program

The typical X-15 mission began with the air launch of the X-15 from beneath the wing of a Boeing B-52 aircraft at an altitude of 38,000 feet above Wendover, Utah. Upon being dropped, the rocket engine provided thrust for the first 80 to 120 seconds of flight. During this time, it climbed to the edges of the atmosphere (CA-235-4). The remainder of the flight was powerless. The aircraft glided through the "High Range", a test corridor containing a network of three tracking stations (at Ely, Nevada; Beatty, Nevada; and Edwards AFB, California) that monitored the flight, and landed on the dry lake bed at Edwards AFB. (Hallion 1989; U.S. Air Force 1957.)

A total of 199 flights were made between 1959 and 1968, reaching altitudes of 354,000 feet (approximately 67 miles) and speeds of up to Mach 6.7 (4,520 miles per hour) (North American Aviation ca. 1961). Accomplishments of the X-15 program include:

- the first use of reaction controls for attitude control in space;
- development of the first reusable superalloy structure capable of withstanding temperatures and thermal gradients of hypersonic reentry;
- development of the first practical full-pressure suit for pilot protection in space;
- development of internal flight data systems capable of functioning in a high-dynamic pressure and space environment;
- demonstration that pilots could fly rocket-propelled aircraft out of the atmosphere and return them to selected landing areas with great precision and accuracy;
- reaffirmation of the importance of man in space as director and monitor of machine and system operation;
- establishment of the groundwork in the area of organization and cooperation between the Air Force, the Navy, and NASA necessary for future work in space exploration;
- demonstration of a pilot's ability to function in a weightless environment; and

- use of the aircraft as testbeds carrying a wide variety of experimental packages such as insulation for the Saturn booster and advanced celestial navigation equipment (Thompson 1992; Hallion 1984).

The X-15 tested prototypes for the Mercury and Apollo missions. These accomplishments, among others, laid the groundwork for the United States space program. Ultimately, the space shuttle, a reusable manned spacecraft, has benefitted most from the research conducted with the X-15.

X-15 and the Space Program

The Man-in-Space theme, under which the X-15 engine test complex was evaluated, includes the pre-1958 technical foundations and technological advances that made space exploration possible, as well as the concerted effort from 1958 to 1969 to land a man on the moon. From the creation of the Air Force Materiel Command's Flight Test Base at Muroc Army Air Base until the successful Apollo 11 moon landing, the facilities at Edwards AFB played an integral role in the testing and development of propulsion systems and vehicles essential for space exploration (Walker and Wickam 1986; Hallion 1984; Swenson et al. 1966; Butowsky 1984).

Early research and testing of hypersonic and supersonic aircraft (the X-planes) and the effects of high-speed, high-altitude flight on materials and pilots provided the foundations for manned space flight (CA-235-5). X-15 research confirmed that exo-atmospheric manned flight was possible and provided physiological data on human reactions to weightlessness. The first full-pressure suit for use in a space environment was developed during the X-15 program. X-15 research resulted in the development of the first reusable superalloy structure capable of withstanding high temperatures encountered during reentry to the earth's atmosphere. The X-15 bridged the gap between atmospheric and space flight and was instrumental in many aspects of design and development of the vehicles and equipment that would eventually be sent into space.

PART 3. HISTORY OF THE X-15 ENGINE TEST COMPLEX

The X-15 Engine Test Facility was completed in October 1958 and was used to test XLR-11 engines, XLR-99 engines, and complete X-15 aircraft, after delivery and prior to test flights (U.S. Air Force 1958). The first X-15 research aircraft arrived at Edwards AFB on October 17, 1958. North American Aviation personnel "immediately performed pressurization tests and flow check on the propulsion systems test stand in preparation for the first modified XLR-11 engine tests" (U.S. Air Force 1958:8-3). In the interest of expediency, propulsion personnel moved to the X-15 engine test complex at the main base from the rocket propulsion laboratory on Leuhman Ridge.

This test complex was used to test the XLR-11 and XLR-99 engines, alone and installed in the X-15 aircraft. Prior to flight, the engines were subjected to several controllability and functional

tests (U.S. Air Force 1958). Vibration tests were performed on the entire X-15 aircraft. The test complex was in use until the completion of the X-15 program in 1968.

PART 4. DESCRIPTION OF THE X-15 ENGINE TEST COMPLEX

Original Plan of the X-15 Engine Test Complex

Original construction of the complex began in 1958 with construction of the two test stands, the control bunker (Bldg. 1926), the maintenance shop (Bldg. 1928), and the water storage tank and pump building (Bldgs. 1929 and 1930) (CA-235-1, CA-235-2). The design contract for the X-15 Rocket Engine Test Facility was awarded to the Macco Corporation in June 1957 (U.S. Air Force 1958). In February 1958, the contract for the construction of the facility was awarded to P. J. Walker Company at a fixed price of \$318,000. The final cost exceeded \$400,000. (U.S. Air Force 1958.)

As originally constructed, both test stands consisted of a concrete slab, a heavy steel thrust mounting, two sets of three fluorescent light fixtures, and water deluge system shower heads (CA-235-A-6). At the northeast end of each test stand was a reinforced concrete flame deflector. Both test stands had protective concrete walls behind which fuel, a water hydrant, and other materials were stored during test firing.

Changes in the X-15 Engine Test Complex

Additions and alterations to the complex were made between 1958 and 1995. In 1959, a lean-to was added to the southeast elevation of Bldg. 1928, the maintenance shop, which expanded the area of the building considerably. Some time before 1969, a lean-to was added to the opposite (northwest) elevation of the same building. In 1960, the supply and issue shop (Bldg. 1931) was moved from North Base to the X-15 Rocket Engine Test Facility and three identical observation bunkers (Bldgs. 1932, 1933, and 1934) were constructed at the complex X-15 aircraft test stand (CA-235-3). An explosion damaged the test stand capable of accommodating the complete X-15 aircraft in June 1960. Archival resources do not indicate whether the stand was returned to its original configuration or if repairs included alterations. Most recently, in 1995, Bldg. 1931 was renovated for use as a chemical storage area.

The rolling, open-sided, gable-roofed shelter has been removed. The structure originally moved on tracks to cover the rocket engine test stand. Other changes made to the area include the addition of a door opening in the water storage tank (Bldg. 1929) and the addition of a steel beam post-and-lintel arch to the X-15 vehicle test stand. (Kompordides 1996.)

Current Features and Appearance

The X-15 engine test facility is located just east of the flight line at Edwards AFB. The complex is accessible via one of two roads that lead southeast from Taxiway D. From the westernmost access road, the water storage and water pump buildings (Bldgs. 1929 and 1930) are located just east of the entrance. The supply and issue shop (Bldg. 1931) is located immediately to the east just past the entrance. The largest building in the complex is the maintenance shop (Bldg. 1928). The test stands, observation bunkers, and control bunker are located in the eastern half of the complex. The complete X-15 aircraft engine test stand is located in the northeastern quarter of the complex. An associated concrete blast deflector is located to the northeast, where the engine would fire. The X-15 test stand and the observation bunkers associated with it are located in the southeast corner of the fenced complex. When mounted, the X-15 aircraft would have pointed to the southwest and fired to the northeast, where a reinforced concrete and steel blast deflector is located. Three identical observation bunkers provided a protected space from which to control and observe the testing. Bldg. 1932 is located approximately 30 feet north of the test stand and is oriented north-south. Bldg. 1933 is located approximately 20 feet south of the test stand and is oriented north-south at a perpendicular angle to the stand. Bldg. 1934 is located approximately 45 feet southwest of the test stand and is oriented northeast-southwest. The control bunker is an earth-filled, reinforced concrete control bunker shaped like a truncated pyramid and located midway between the two test stands.

Buildings in the area are currently used for storage. The test stands are no longer in use.

Control Bunker, Bldg. 1926. The control bunker is located between the two test stands. It measures 15 by 37 feet and is a brown, earth-filled reinforced concrete structure shaped like a truncated pyramid. A small, cube-shaped ventilation cupola is located near the center of the flat roof. A deeply recessed, square entryway leading to a steel fire door is located on the southwest facade (CA-235-D-1). Nine steel rungs imbedded in the concrete of the wall form a ladder to the southeast of the entrance. The other three elevations have no fenestration or detail. The control bunker is currently used for storage.

Maintenance Shop, Bldg. 1928. The maintenance shop is a corrugated metal building centered along the southwest fence line of the complex (CA-235-C-2). It has a poured concrete foundation and a gabled aluminum roof with very slight overhangs. The roof line is broken by shed-roofed additions on either side. The front (northeast) facade is dominated by large sliding bay doors. Other fenestration consists of single entry doors on the other elevations.

Water Storage Tank, Bldg. 1929. Bldg. 1929 is a cylindrical steel-plate water storage tank that supplied water for the test stand deluge system (CA-235-C-1, CA-235-C-3). The tank stands approximately 24 feet tall and has a conical roof. A ladder is located on the southeast side of the

tower and leads to a round hatch on the top. Large water pipes with valve handles run along the side and bottom of the tank. A scale for measuring volume is located northeast of the ladder and pipes.

Water Pump Building, Bldg. 1930. Located immediately northeast of the water tank, Bldg. 1930 housed the pumping equipment for the test stand deluge system (CA-235-C-1). The pump house is a gable-roofed, corrugated metal, one-story building on a poured concrete foundation. The front (southeast) facade has double sliding bay doors. A small concrete entry apron is located in front of the main doors. A heavy I-beam to support a winch extends from the top center of the double doors. Other fenestration includes a single entry door on the northeast elevation. A large water pipe from the water tank enters the southwest elevation. The building is currently used for storage.

Supply and Issue Shop, Bldg. 1931. This building was added to the complex in 1960 and was completely renovated in the 1990s. It is a rectangular one-story building with a poured concrete foundation and corrugated aluminum siding and roofing. Two 2-foot-high concrete block footing walls extend along the northwest and southeast elevations and wrap around the corners onto portions of the front and rear elevations. Fenestration includes swinging doors on the front (northeast) facade and a single entry door on the southwest elevation. A covered area or shed is located on the northwest elevation. The building is currently being used for chemical storage.

Test Stands. Two test stands are located at the X-15 engine test complex. Both test stands were completed in 1958. The rocket engine thrust test stand occupies the northeastern quarter of the complex. The test stand designed to accommodate a complete X-15 aircraft is located in the southeastern quarter of the complex.

The engine test stand is oriented so that a mounted engine would fire toward the northeast (CA-235-A-1, CA-235-A-2). A concrete pad measuring 15 by 40 feet is flush with the surrounding asphalt. The concrete pad is cut by two flush-mounted steel rails that once carried a gable-roof mobile shelter and lead away to the southwest edge of the compound. Centered on the concrete pad is a large steel thrust mounting block consisting of a massive, heavily braced square frame of steel beams with a wide, round aperture in the center. A long, narrow pit covered with removable steel grating leads southwest from the mounting block. On either long side (northwest and southeast) of the engine mount and pit are two long racks, each carrying three fluorescent lighting fixtures and five water deluge system shower heads. The racks consist of three I-beams posts each connected by an I-beam lintel. All steel work is painted bright yellow, the original color. (The repainting is fairly recent and was undertaken by some airmen interested in preserving the X-15 complex.) Along the southeast edge of the test stand is a low metal box containing instrumentation cable connections. A safety shower stands just to the side of the front of the test stand in the southeast. Immediately northwest of the test stand, and parallel to it, is a high concrete wall approximately 1½ feet thick, painted brown. The wall shielded instrumentation (remnants now badly damaged), a water hydrant, a small spherical tank, and liquid oxygen tank trucks from test firings. Behind the test stand to the

northeast, near the compound's fence line, is a large wedge-shaped flame deflector of reinforced concrete, protected on its exposed surface by thick steel plates.

The test stand for the complete X-15 aircraft consists of a heavy concrete slab, a steel thrust mounting, and a steel frame. When mounted, the X-15 would have fired to the northeast (CA-235-A-3). The heavy concrete slab is approximately 15 by 40 feet with a long, narrow pit down the center. Steel gratings may once have covered this pit, but are now missing. The central portion of the concrete slab is raised several inches above the surrounding surface. At the northeast end of the raised area is the massive steel thrust mounting, a vertical rectangle of heavy steel I-beams diagonally braced by thick steel tubing (CA-235-A-4). Two tall I-beam posts connected by an I-beam lintel straddle the concrete pad. This arch was not originally part of the test stand. To either side of the test stand are three tall stanchions, each holding a fluorescent light fixture. Shower heads for the water deluge system stand on tall pipes near the southwest end. A massive concrete wall, of the same type standing next to the engine test stand, runs at a diagonal angle to the north of the thrust mounting. A smaller concrete wall stands to the northwest parallel to the concrete pad. To the northeast is a flame deflector of the same design as the one behind the engine stand (CA-235-A-5). The X-15 test stand is now used as a basketball course. Run-off gutters for both test stands carried deluge water away toward lined ditches and reservoirs northeast of the test complex.

Observation Bunkers. These semi-subterranean observation bunkers convey their purpose and the hazardous nature of the testing that was conducted at the X-15 engine test facility. The bunkers provided protection for personnel while they were conducting and viewing tests on the test stand for the complete X-15 aircraft. All the bunkers appear to be in good condition from the exterior. They do not appear to have been reused for any purpose after X-15 testing was completed.

The three observation bunkers are identical square, reinforced concrete blocks protruding approximately 2 feet above the ground surface (CA-235-B-2). One side of the cube is wedged and contains the steel and concrete roof entrance, which is hinged with counterbalances. When closed, the door is a protruding concrete and steel square on the sloping side of the cube (CA-235-B-3). When open, the door stops against a small bumper projecting from the flat roof. A poured concrete step with two hand-grab poles is located in front of the entrance. A pair of horizontal double paned windows protected by vertical iron bars are located at ground level on the elevation facing the test stand (CA-235-B-1). Bldgs. 1932, 1933, and 1934 are currently painted brown.

A very steep metal staircase leads into a small square space, large enough to accommodate only a few people. The floor, walls, and ceiling are reinforced concrete. Interior furnishings include a plywood control desk with a raised lip and openings for various instrumentation (likely for firing control). Bldg. 1934 appears to be in good condition. Bldg. 1932 is filled with water, and Bldg. 1933 could not be opened.

PART 5. SOURCES OF INFORMATION

Interviews

No interviews with persons associated with the X-15 engine test complex have been conducted.

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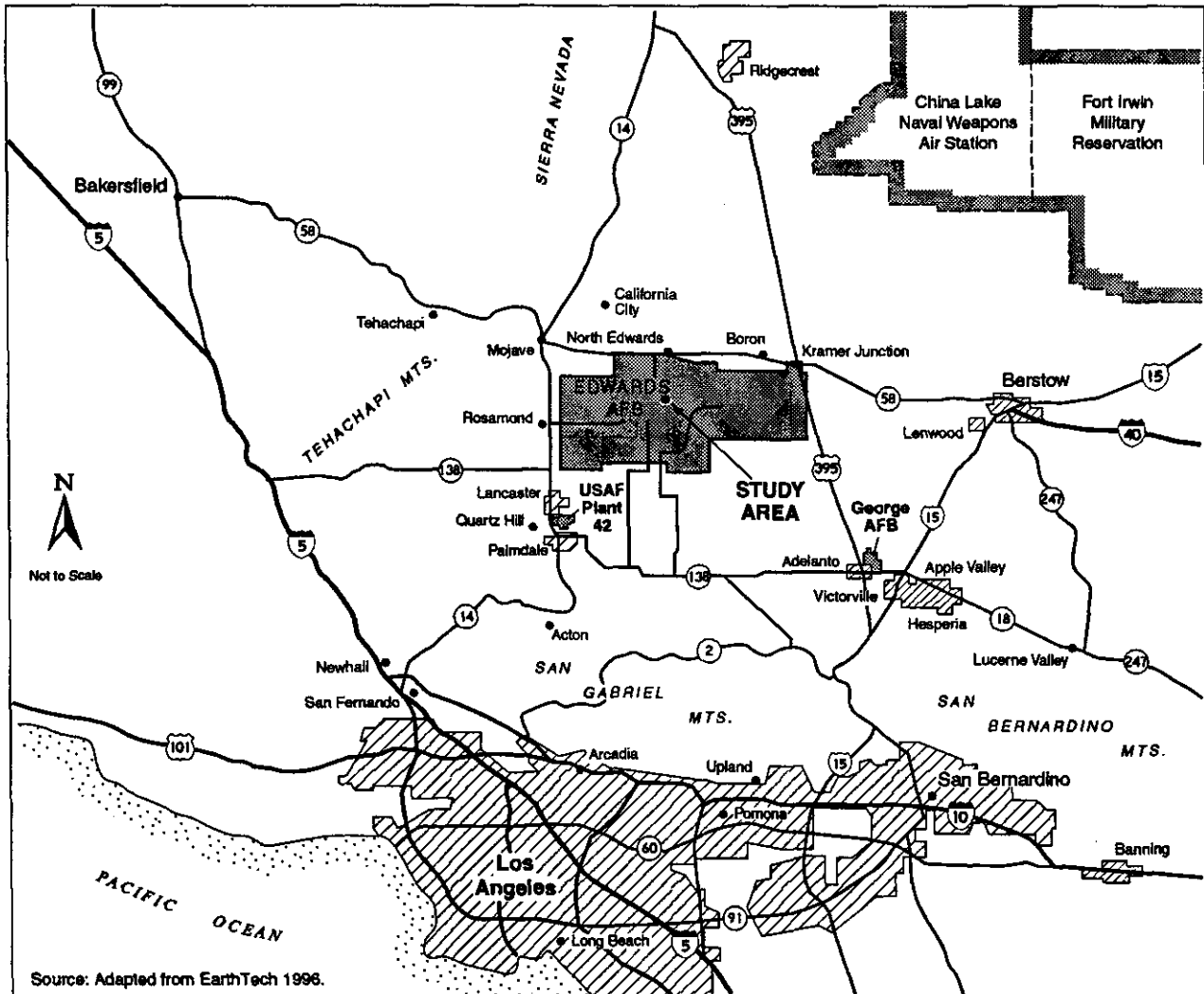
Supplemental Material

Location maps and site maps follow page 14.

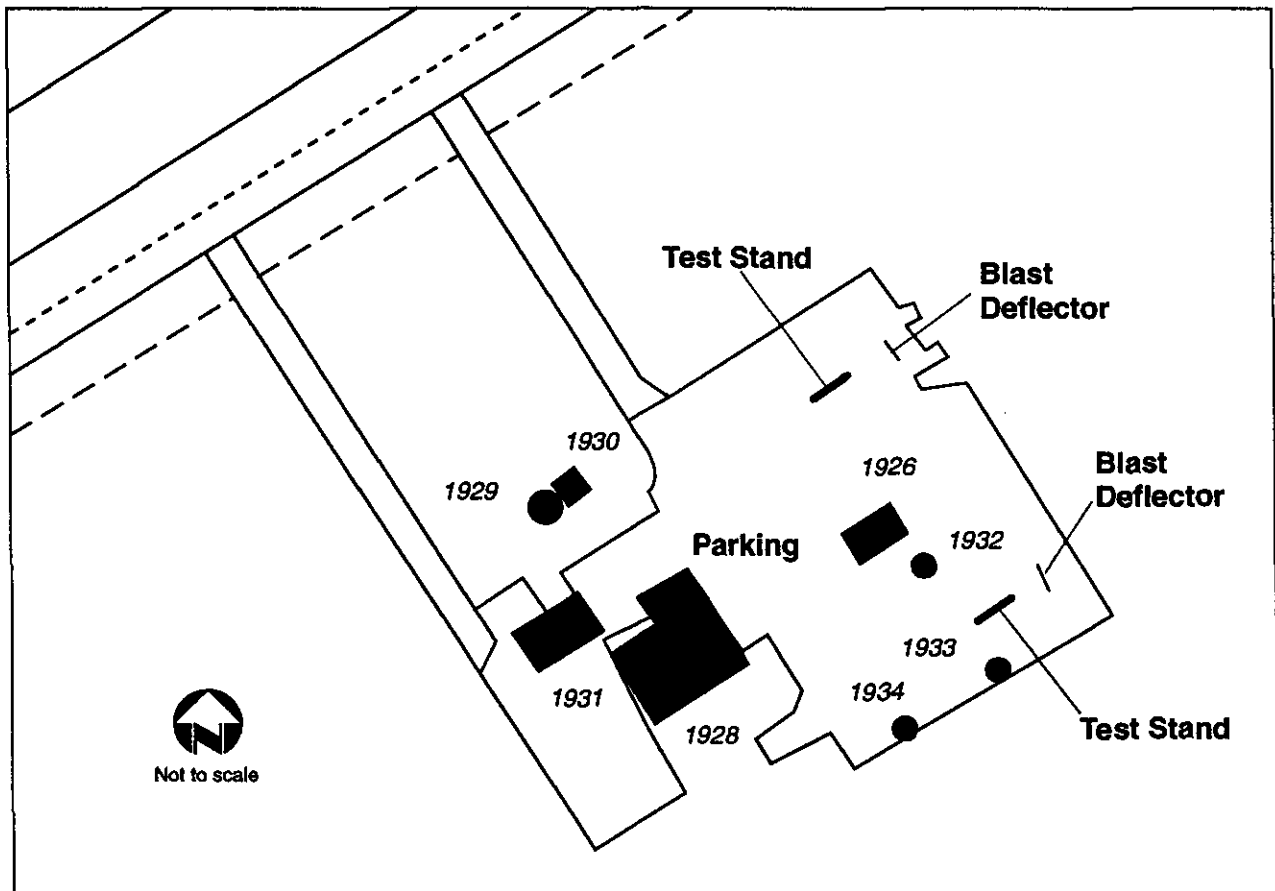
PART 6. PROJECT INFORMATION

This report has been prepared to mitigate the negative effects of the proposed destruction of three buildings within the X-15 Engine Test Complex. The buildings proposed for demolition are three identical observation bunkers (Bldgs. 1932, 1933, and 1934) associated with the test stand designed to accommodate a complete X-15 aircraft. A previous study recommended the X-15 Engine Test Complex as being eligible for listing in the National Register of Historic Places (NRHP) under Criterion A as a historic district and Criteria Consideration G as a property having achieved significance within the last 50 years (Tetra Tech 1996). Because these buildings are contributing elements of the X-15 Engine Test Complex historic district, their demolition will affect the integrity of the facility as a whole. As such, this document addresses the entire facility.

This project was conducted under Contract DACW05-95-D-0003/Task Order 071, and was overseen by the Edwards AFB Historic Preservation Officer, Richard Norwood. The narrative portion of this document was prepared by Susan Lassell, Shahira Ashkar, and Dana McGowan of Jones & Stokes Associates (Sacramento, California). Photographic documentation was completed by David DeVries of Mesa Technical, Berkeley, California.



Project Vicinity Map, Edwards AFB, California



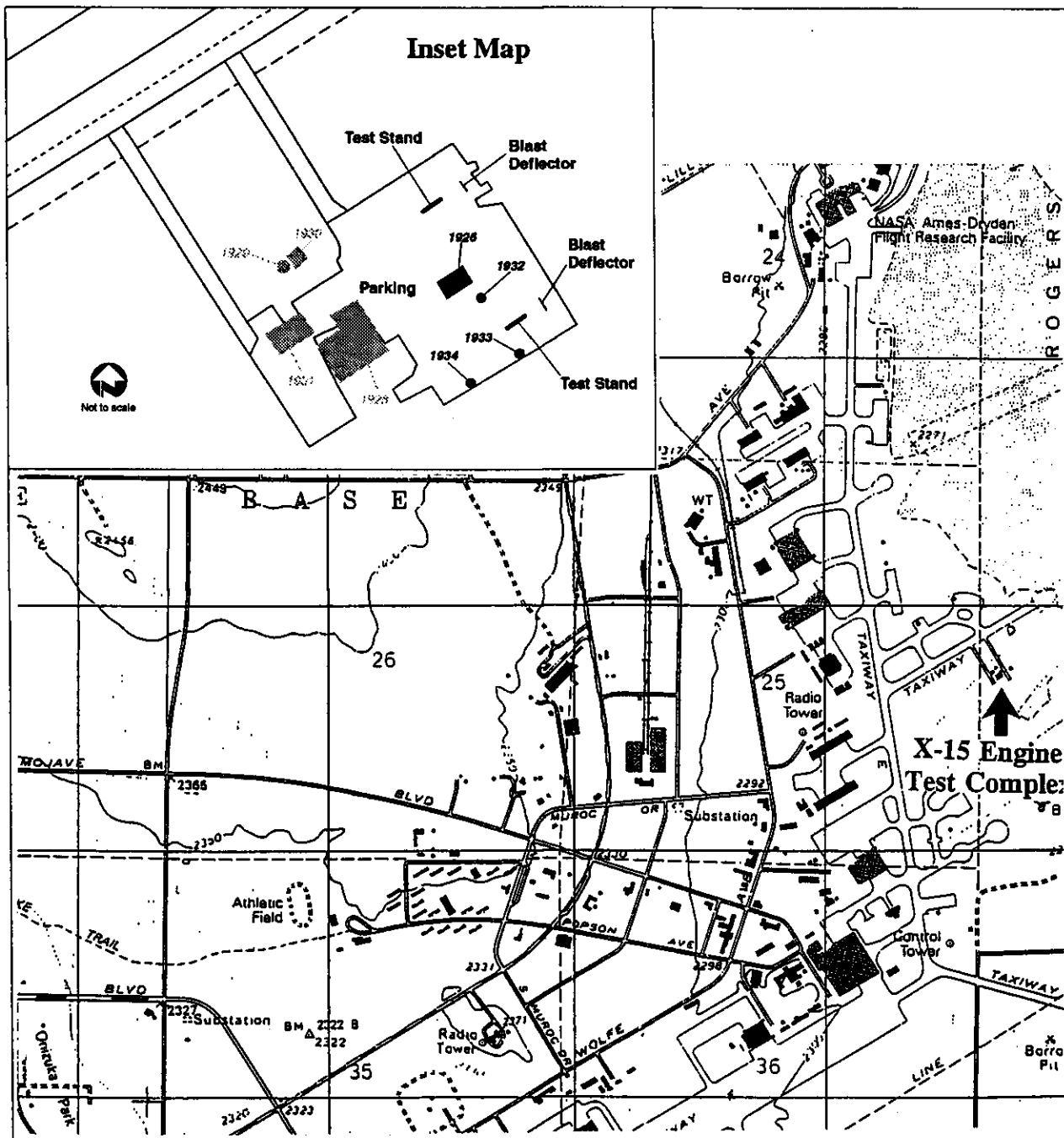
Key Features of X-15 Engine Test Complex,
Shown in Bold



Base map: USGS 7.5'-series Edwards,
California, quadrangle (1992)



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Buildings Proposed for Demolition,
X-15 Complex Shown in Bold on the Inset Map